



US008446058B2

(12) **United States Patent**  
**Avula et al.**

(10) **Patent No.:** **US 8,446,058 B2**  
(45) **Date of Patent:** **May 21, 2013**

(54) **ELECTRIC MOTOR TERMINAL BLOCK ASSEMBLY**

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(\*) Notice: Subject to any disclaimer, the term of this  
patent is extended or adjusted under 35  
U.S.C. 154(b) by 319 days.

(21) Appl. No.: **12/886,071**

(22) Filed: **Sep. 20, 2010**

(65) **Prior Publication Data**

US 2012/0068563 A1 Mar. 22, 2012

(51) **Int. Cl.**  
**H02K 11/00** (2006.01)

(52) **U.S. Cl.**  
USPC ..... **310/71; 310/89**

(58) **Field of Classification Search**  
USPC ..... **310/71, 89; 439/709, 810**  
See application file for complete search history.

(56) **References Cited**

**U.S. PATENT DOCUMENTS**

311,378 A	1/1885	Saunders
323,813 A	8/1885	Kimball
2,403,642 A	7/1946	Draxler
2,552,025 A	5/1951	Blair
3,585,427 A	6/1971	Paule
3,601,760 A	8/1971	Cairns
3,626,253 A	12/1971	Sturdivan
3,644,066 A	2/1972	Heob et al.
3,786,208 A	1/1974	Edwards
3,900,769 A	8/1975	Russo, Jr.
4,029,372 A	6/1977	Clark

4,034,173 A	7/1977	Crow et al.
4,071,793 A	1/1978	Cox
4,090,230 A	5/1978	Fuller et al.
4,097,109 A	6/1978	Cross
4,214,801 A	7/1980	Cairns et al.
4,221,455 A	9/1980	Cairns et al.
4,221,456 A	9/1980	Cairns et al.
4,226,493 A	10/1980	Cairns et al.
4,227,761 A	10/1980	Cairns et al.
4,238,140 A	12/1980	Cairns et al.
4,250,420 A	2/1981	Grah et al.
4,329,757 A	5/1982	Ramstrom et al.
4,390,219 A	6/1983	Beehler
4,418,271 A	11/1983	Smock
4,418,975 A	12/1983	O'Keefe, II
4,476,407 A	10/1984	Hildebrandt et al.
4,541,036 A	9/1985	Landries et al.
4,585,964 A	4/1986	Hildebrandt
4,602,178 A	7/1986	Larsson
4,628,236 A *	12/1986	Schaefer ..... 318/558
4,636,669 A	1/1987	Plunkett et al.
4,684,202 A	8/1987	House et al.
4,748,531 A	5/1988	Ortiz

(Continued)

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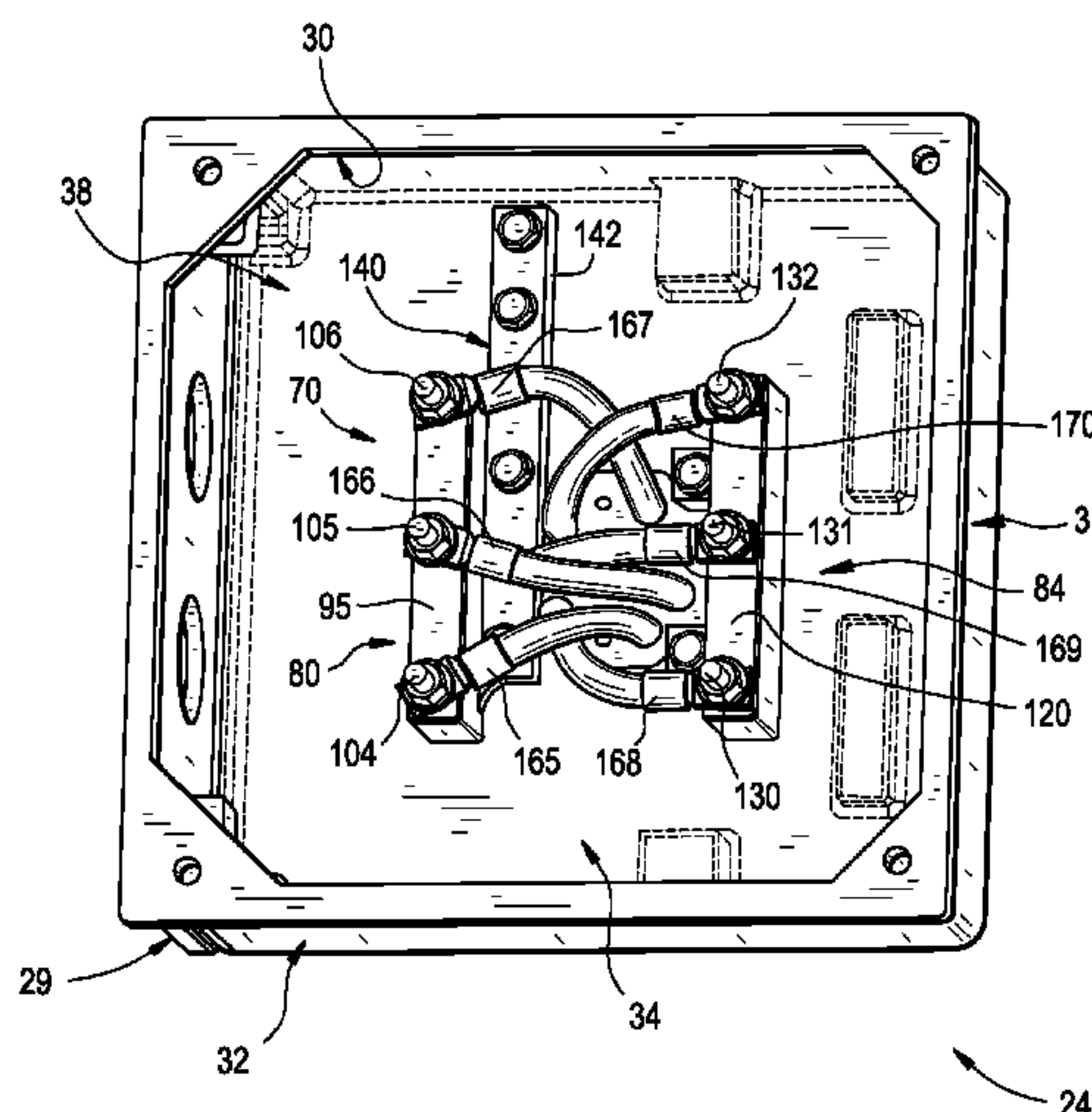
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(57) **ABSTRACT**

An electric motor includes a housing, and a stator arranged within the housing. The stator includes a plurality of terminal leads. A terminal box is mounted to the housing, and a terminal block assembly arranged within the terminal box. The terminal block assembly includes a terminal block portion having a first plurality of terminals and a terminal block section that is distinct from the terminal block portion. The terminal block section including a second plurality of terminals. The terminal block portion is configured and disposed to be spaced from the terminal block section in the terminal box. The plurality of terminal leads is electrically connected to corresponding ones of the first and second pluralities of terminals.

**7 Claims, 4 Drawing Sheets**



U.S. PATENT DOCUMENTS							
4,754,179	A	6/1988	Capuano et al.	6,271,608	B1 *	8/2001	Haydock et al. .... 310/71
4,781,610	A *	11/1988	Mercer ..... 439/217	6,300,698	B1	10/2001	Fargo et al.
4,789,224	A	12/1988	Bougsty	6,309,253	B1	10/2001	Tsai
4,851,725	A	7/1989	Keck	6,318,360	B1	11/2001	Attolini
4,880,391	A *	11/1989	Hurtgen ..... 439/221	6,375,439	B1	4/2002	Missio
4,940,423	A	7/1990	Aihara et al.	6,388,894	B1	5/2002	Paggi et al.
5,015,894	A	5/1991	Crow et al.	6,455,962	B2	9/2002	Suzuki et al.
5,023,498	A	6/1991	Abe	6,545,860	B1	4/2003	Pierce
5,063,314	A	11/1991	DeSantis	6,608,414	B1 *	8/2003	Conley ..... 310/89
5,097,168	A	3/1992	Takekoshi et al.	6,686,712	B2	2/2004	Numaguchi et al.
5,113,101	A	5/1992	Liu et al.	6,824,432	B2 *	11/2004	Katsuzawa et al. .... 439/709
5,115,701	A	5/1992	Lehnert	6,842,352	B2	1/2005	Naito et al.
5,195,913	A	3/1993	Shattuck	6,856,056	B2 *	2/2005	Lyle et al. .... 310/71
5,381,501	A	1/1995	Cardinal et al.	6,879,070	B2	4/2005	Leany et al.
5,408,154	A *	4/1995	Meiser et al. .... 310/71	6,909,208	B2	6/2005	Suzuki et al.
5,456,348	A	10/1995	Whetsel et al.	6,916,213	B2 *	7/2005	Nyblin et al. .... 439/709
5,483,212	A	1/1996	Lankuttis et al.	6,984,635	B1	1/2006	Schreiber et al.
5,483,213	A	1/1996	Mueller et al.	7,082,141	B2	7/2006	Sharma et al.
5,606,299	A	2/1997	Innes et al.	7,092,406	B2	8/2006	Sharma et al.
5,794,325	A	8/1998	Fallandy	7,134,993	B2	11/2006	Lia et al.
5,822,168	A	10/1998	Boudet et al.	7,181,923	B2	2/2007	Kurita et al.
5,861,689	A	1/1999	Snider et al.	7,348,696	B2	3/2008	Sonohara et al.
5,907,244	A	5/1999	Crabill et al.	7,442,095	B2	10/2008	Sonohara
5,989,085	A	11/1999	Suzuki	7,445,529	B2	11/2008	Takizawa et al.
6,048,219	A	4/2000	Kotowski	7,542,555	B2	6/2009	Caswell et al.
6,059,613	A	5/2000	Feher et al.	7,615,975	B2	11/2009	Tsukashima et al.
6,149,471	A	11/2000	Kemp et al.	2011/0266900	A1 *	11/2011	Gaumer et al. .... 310/71
6,220,901	B1 *	4/2001	Fisher et al. .... 439/709	* cited by examiner			

FIG. 1

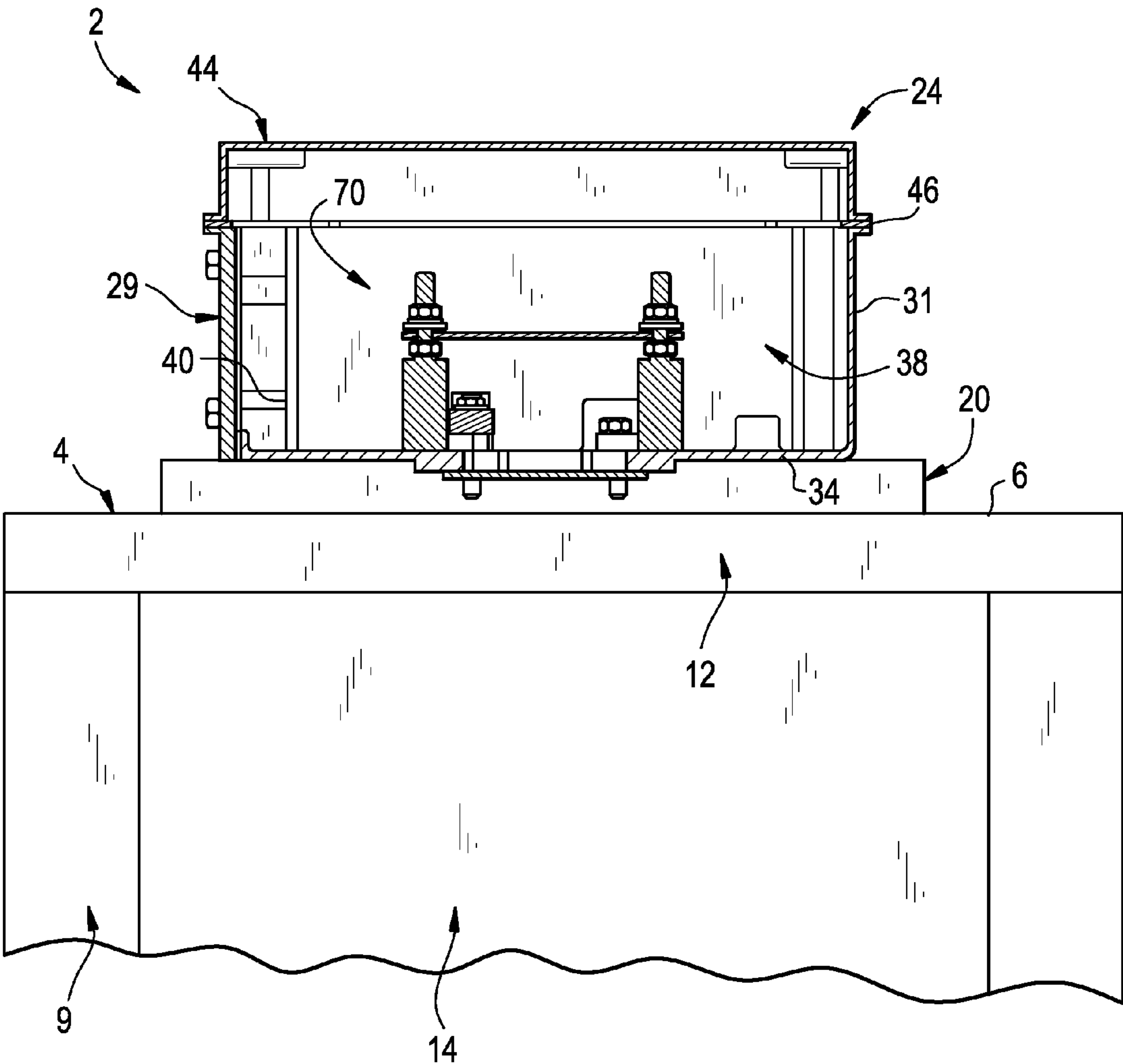


FIG. 2

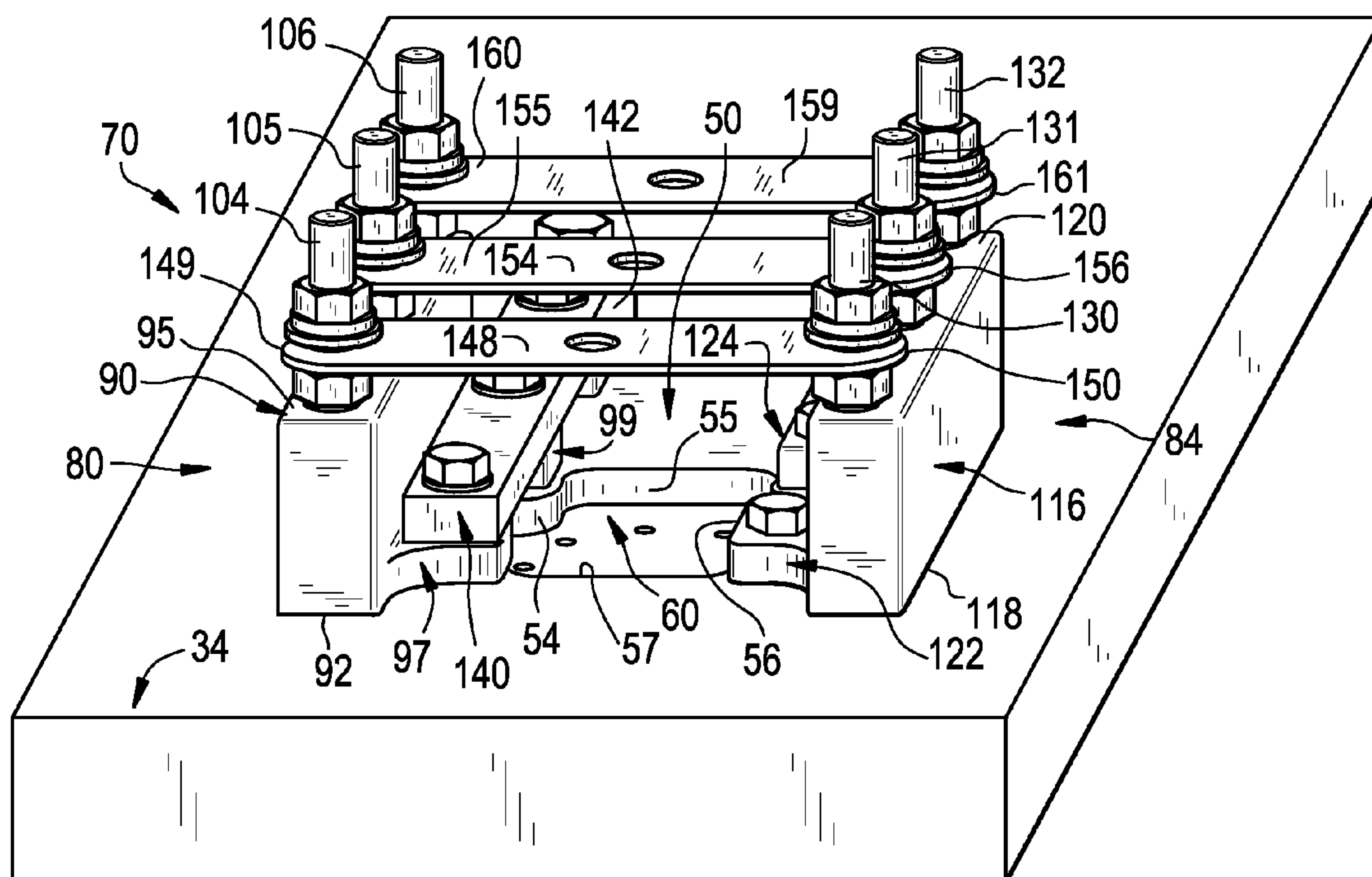


FIG. 3

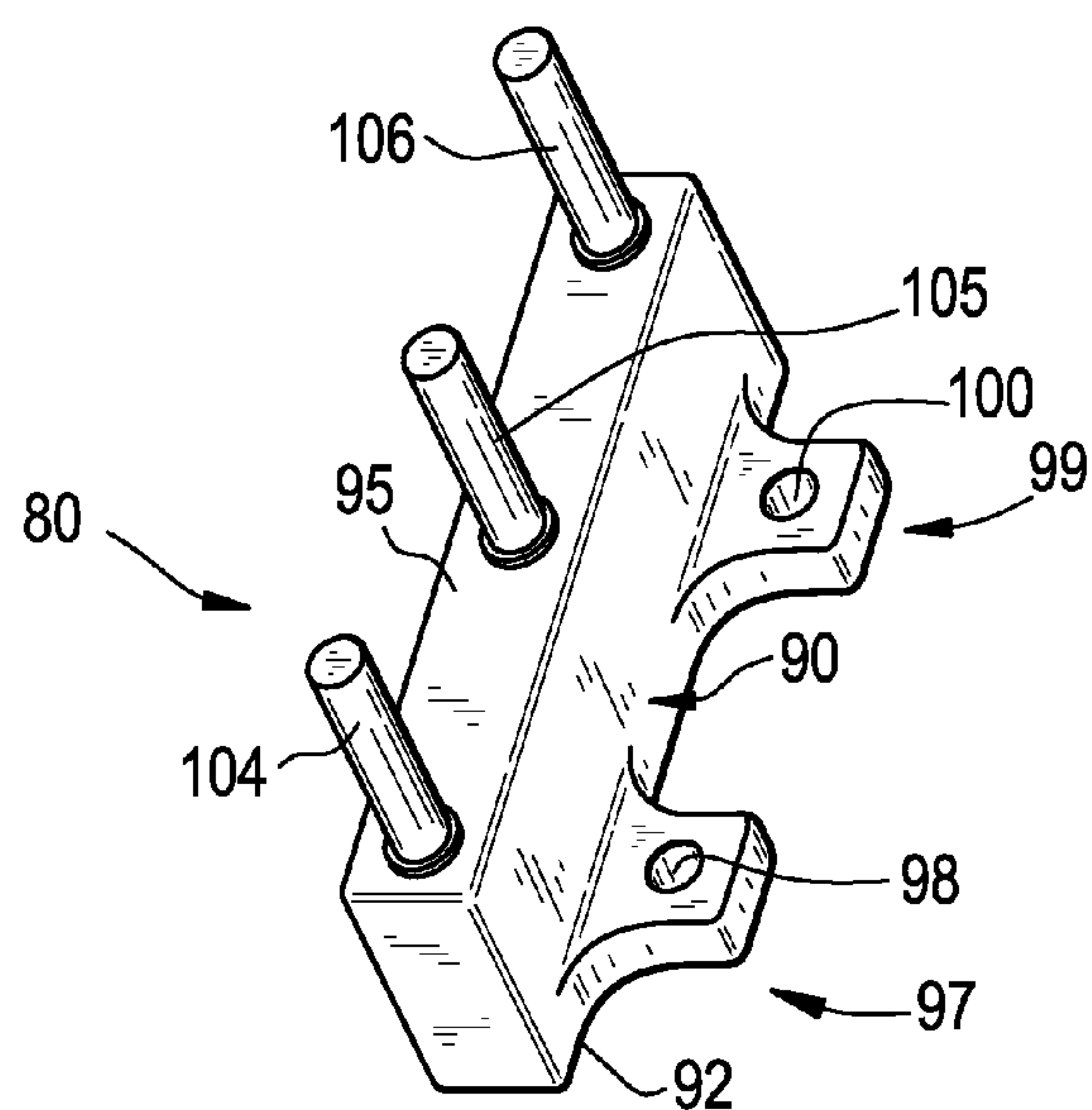




FIG. 4

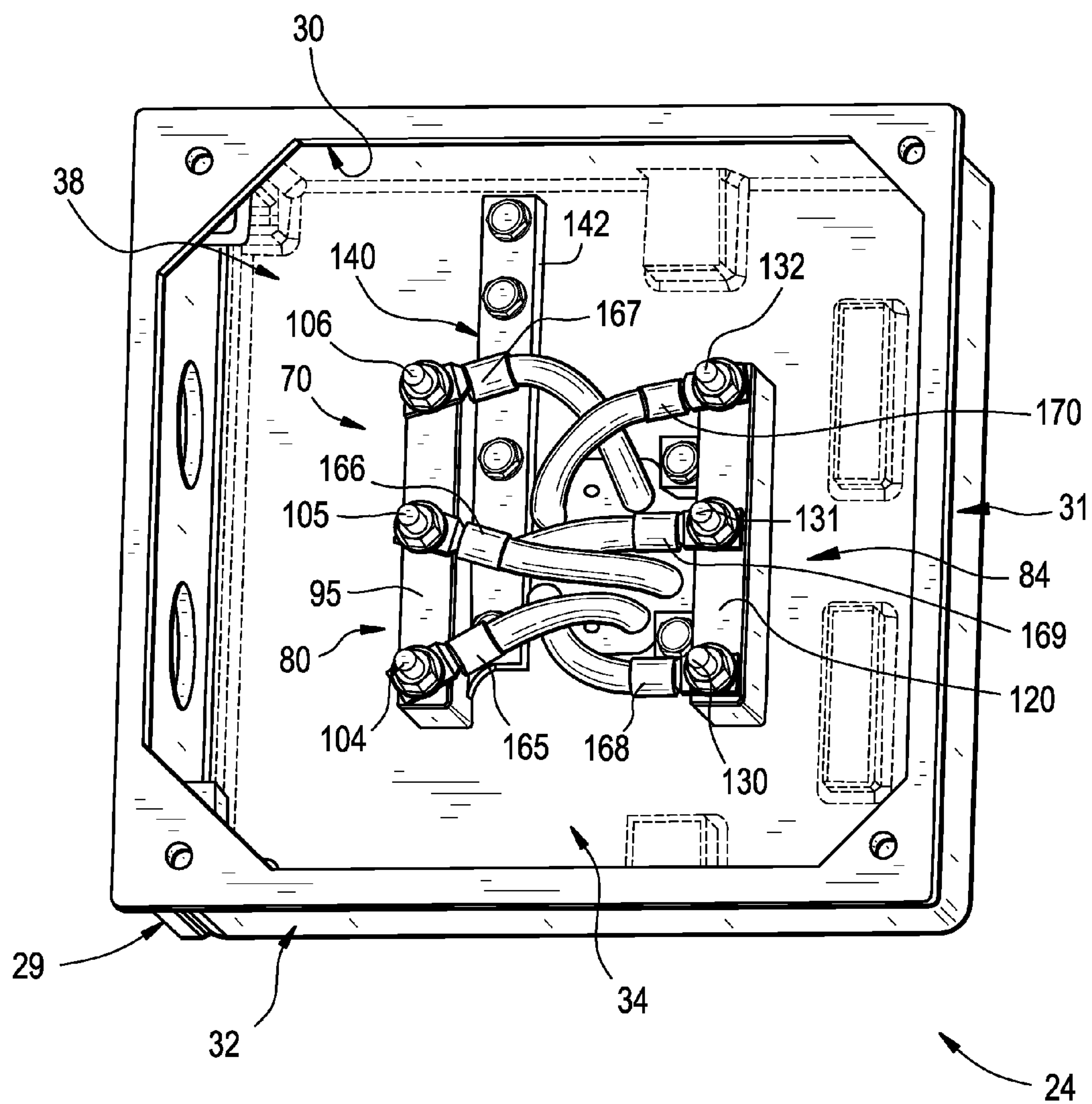
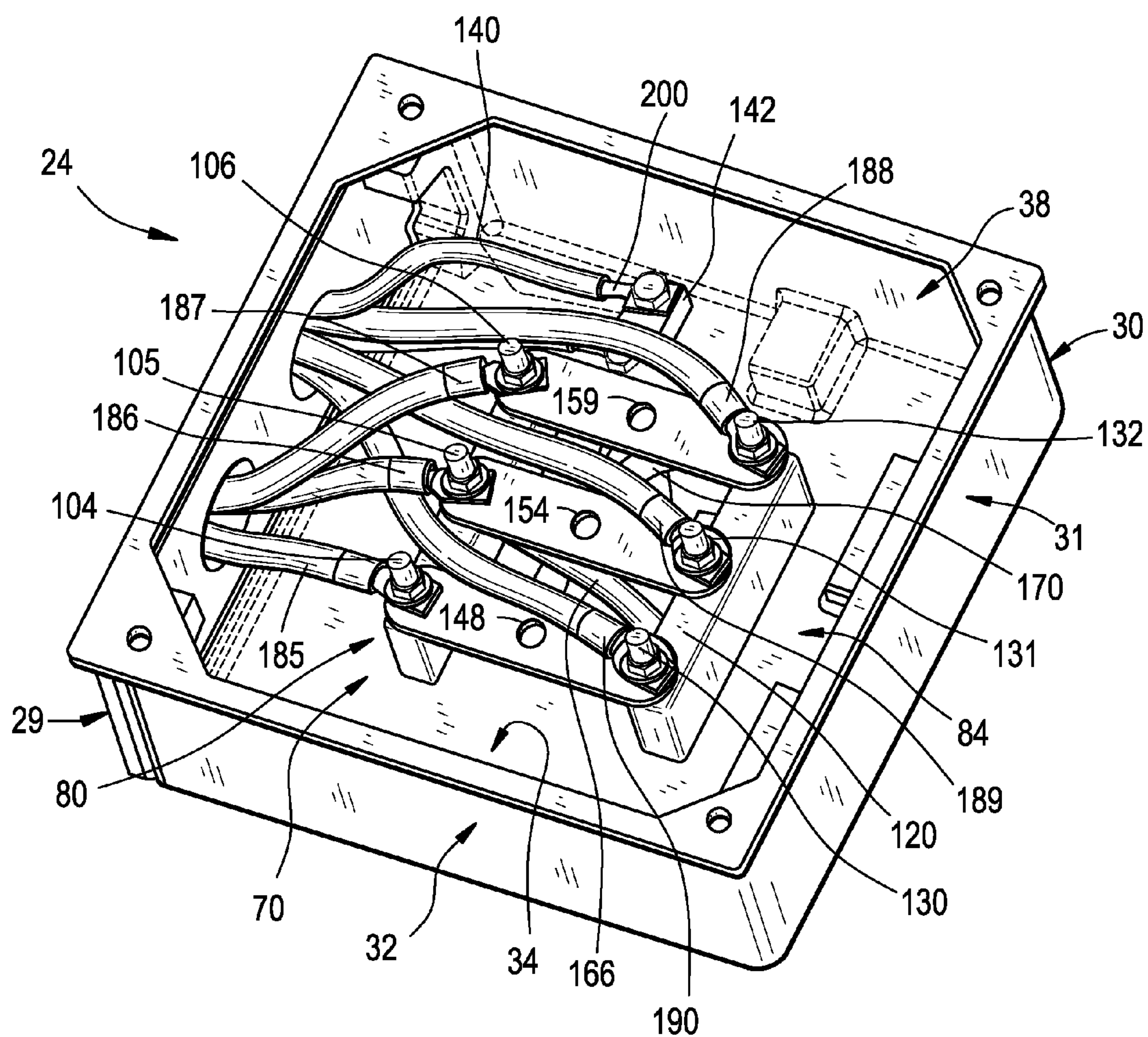


FIG. 5





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## ELECTRIC MOTOR TERMINAL BLOCK ASSEMBLY

### BACKGROUND OF THE INVENTION

The subject matter disclosed herein relates to rotating electric machine and, more particularly, to a terminal block assembly for an electric motor.

Conventional electric motors manufactured to International Electrotechnical Commission (IEC) standards employ a terminal block to connect motor leads to available power leads. The terminal block is mounted in a housing attached to the motor. Once mounted, motor leads are attached to a first set of terminals on the terminal block and conductors that provide power are attached to a second set of terminals on the terminal block. Often times, the first and second sets of terminals are connected to establish a desired connection, such as wye or delta, for the electric motor.

### BRIEF DESCRIPTION OF THE INVENTION

According to one aspect of the invention, an electric motor includes a housing, and a stator arranged within the housing. The stator includes a plurality of terminal leads. A terminal box is mounted to the housing, and a terminal block assembly arranged within the terminal box. The terminal block assembly includes a terminal block portion having a first plurality of terminals and a terminal block section that is distinct from the terminal block portion. The terminal block section includes a second plurality of terminals. The terminal block portion is configured and disposed to be spaced from the terminal block section in the terminal box. The plurality of terminal leads is electrically connected to corresponding ones of the first and second pluralities of terminals.

According to another aspect of the invention, an electric motor terminal block assembly includes a terminal block portion having a first plurality of terminals, and a terminal block section that is distinct from the terminal block portion. The terminal block section includes a second plurality of terminals. The terminal block portion is configured and disposed to be spaced from the terminal block section in a terminal box.

These and other advantages and features will become more apparent from the following description taken in conjunction with the drawings.

### BRIEF DESCRIPTION OF THE DRAWING

The subject matter, which is regarded as the invention, is particularly pointed out and distinctly claimed in the claims at the conclusion of the specification. The foregoing and other features, and advantages of the invention are apparent from the following detailed description taken in conjunction with the accompanying drawings in which:

FIG. 1 is a partial cross-sectional view of an electric motor including a terminal block assembly arranged in a terminal box in accordance with an exemplary embodiment;

FIG. 2 is a lower right perspective view of the terminal block assembly of FIG. 1 shown arranged in a delta wiring configuration;

FIG. 3 is a lower right perspective view of a terminal block portion of the terminal block assembly of FIG. 2;

FIG. 4 is an upper perspective view of the terminal block assembly connected to motor terminal leads and mounted in the terminal box of FIG. 1; and

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FIG. 5 is an upper perspective view of the terminal block assembly in the terminal box of FIG. 1 arranged in the delta configuration and shown connected to terminal leads and to external power source leads.

The detailed description explains embodiments of the invention, together with advantages and features, by way of example with reference to the drawings.

### DETAILED DESCRIPTION OF THE INVENTION

With reference to FIGS. 1-3, an electric motor constructed in accordance with an exemplary embodiment is indicated generally at 2. Electric motor 2 includes a housing 4 having an external surface 6 and an interior portion 9. A stator 12 and a rotor 14 are arranged within interior portion 9. Electric motor 2 is also shown to include a terminal box support member 20 provided on external surface 6 of housing 4. A terminal box 24 is provided upon terminal box support surface 20.

Terminal box 24 includes a first side wall 29, a second side wall 30 (FIG. 4), a third side wall 31 and a fourth side wall 32 that together with a base wall 34 define an interior section 38. In the exemplary embodiment shown, first side wall 29 takes the form of a gland plate 40 that provides an interface for external connections. Terminal box 24 is also shown to include a cover 44 that is secured to side walls 29-32 through a gasket 46. Base wall 34 includes a terminal passage 50 that allows terminals to pass from stator 12 into terminal box 24. Terminal passage 50 includes a first side portion 54, a second side portion 55, a third side portion 56 and a fourth side portion 57 that collectively define an opening 60. Opening 60 includes rounded corners (not separately labeled) that are provided to protect lead wires from damage.

Electric motor 2 includes a terminal board or block assembly 70 arranged in terminal box 24 at terminal passage 50. Terminal block assembly 70 includes a terminal block portion 80 positioned along first side portion 54 and a terminal block section 84 that spaced from terminal block portion 80 across opening 60 and extends along third side portion 56. Terminal block portion 80 includes a body portion 90 having a base portion 92 and a terminal surface portion 95. Base portion 92 includes a first mounting member 97 having an opening 98 and a second mounting member 99 having an opening 100. Each opening 98, 100 is configured to receive a mechanical fastener (not separately labeled) that joins terminal block portion 80 to base wall 34 and terminal box support member 20. Terminal block portion 80 is further shown to include a plurality of terminals 104-106 that extend from terminal surface portion 95. Similarly, terminal block section 84 includes a body section 116.

Terminal block assembly 70 is also shown to include a grounding bar 140 that is secured to terminal block portion 80 at first and second mounting members 97 and 99. Grounding bar 140 includes a mounting support 142 that is mounted to base wall 34 and terminal box support member 20. In the exemplary embodiment shown, terminal block assembly 70 includes a first linking member 148. First linking member 148 includes a first end 149 that is mounted to terminal 104 and a second end 150 that is mounted to terminal 130. Terminal block assembly 70 also includes a second linking member 154 having a first end 155 that is mounted to terminal 105 and a second end 156 that is mounted to terminal 131, and a third linking member 159 having a first end 160 that is mounted to terminal 106 and a second end 161 that is mounted to terminal 132. Linking members 148, 154, and 159 establish a desired electrical connection configuration for stator 12. More specifically, stator 12 includes a plurality of terminals 165-170 (FIG. 4) that extend through terminal passage 50 and electri-



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cally connect with corresponding ones of terminals **104-106** and **130-132**. Once in place, linking members **148**, **154**, and **159** are connected to establish, for example a delta configuration. At this point, power leads **185-187**, **188-190**, and a ground lead **200** are mounted to terminals **104-106**, **130-132**, and grounding bar **140** respectively such as shown in FIG. 5.

At this point it should be understood that the exemplary embodiment provides a multi-piece terminal block assembly for electric motors. Of course, the exemplary embodiments could also be employed in connection with various other electrical machines. By forming the terminal block assembly in multiple components, technicians will have little difficulty making any necessary wiring connections. More over, the use of multiple components provides flexibility in mounting the terminal block assembly so as to accommodate various size conductors without requiring difficult bends, wire cramping and the like that may lead to damage to insulation or loose connections.

While the invention has been described in detail in connection with only a limited number of embodiments, it should be readily understood that the invention is not limited to such disclosed embodiments. Rather, the invention can be modified to incorporate any number of variations, alterations, substitutions or equivalent arrangements not heretofore described, but which are commensurate with the spirit and scope of the invention. Additionally, while various embodiments of the invention have been described, it is to be understood that aspects of the invention may include only some of the described embodiments. Accordingly, the invention is not to be seen as limited by the foregoing description, but is only limited by the scope of the appended claims.

The invention claimed is:

**1.** An electric motor comprising:

a housing;

a stator arranged within the housing, the stator including a plurality of terminal leads;

a terminal box mounted to the housing; and

a terminal block assembly arranged within the terminal box, the terminal block assembly including a terminal block portion including a body portion having a base portion including at least one mounting member secured in the terminal box through a first mechanical fastener and a terminal surface portion supporting a first plurality of terminals and a terminal block section that is distinct from the terminal block portion, the terminal block section including a body section having a base section including at least one mounting element secured in the terminal box through a second mechanical fastener and a terminal surface section supporting a second plurality of terminals, the terminal block portion being config-

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ured and disposed to be spaced from the terminal block section in the terminal box, the plurality of terminal leads being electrically connected to corresponding ones of the first and second pluralities of terminals.

**2.** The electric motor according to claim **1**, further comprising: a grounding bar secured to one of the at least one mounting member and the at least one mounting element, the grounding bar being electrically connected to the housing.

**3.** The electric motor according to claim **1**, further comprising: a plurality of linking members electrically connecting select ones of the first plurality of terminals and the second plurality of terminals, the plurality of linking members establishing a desired electrical configuration for the plurality of terminal leads.

**4.** The electric motor according to claim **1**, further comprising: a terminal passage formed in the terminal box, the terminal passage including a first side portion, a second side portion, a third side portion, and a fourth side portion that collectively define an opening leading into the housing, the terminal block portion being arranged along the first side portion and the terminal block section being arranged on the third side portion opposite the terminal block portion.

**5.** An electric motor terminal block assembly comprising:

a terminal block portion including a body having a base portion having at least one mounting member including at least one opening configured to receive a first mechanical fastener and a terminal surface portion, the terminal surface portion supporting a first plurality of terminals; and

a terminal block section that is distinct from the terminal block portion, the terminal block section including a base section including at least one mounting element having an least one opening configured to receive a second mechanical fastener and a terminal surface section, the terminal surface section supporting a second plurality of terminals, the terminal block portion being configured and disposed to be spaced from the terminal block section in a terminal box.

**6.** The electric motor terminal block assembly according to claim **5**, further comprising: a grounding bar secured to one of the at least one mounting member and the at least one mounting element.

**7.** The electric motor according to claim **5**, further comprising: a plurality of linking members electrically connecting select ones of the first plurality of terminals and the second plurality of terminals, the plurality of linking members establishing a desired electrical configuration for an electric motor.

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